Flight Operations Briefing Notes

## Human Performance

## CRM Aspects in Incidents / Accidents

## I  Introduction

Overall, incidents and accidents involve the entire range of CRM and Human Factors aspects.

In incident and accident reports, the flight crew's contribution often is considered to be just what the flight crew did or did not do.

The following discussion is a focused but limited overview of the broad CRM subject.

CRM concepts and techniques enhance effective cross monitoring and backup by each crewmember.

The minimum content of CRM training is defined by regulations and airlines should consider additional CRM training to account for specific requirements, such as multi-cultural flight crews and different areas of operation.

## II  Statistical data

CRM issues have been identified as circumstantial factors in more than 70 % of approach-and-landing incidents or accidents.

Because CRM practices are a key factor in flightcrew adherence to and performance of normal and non-normal procedures and in the interaction with automated systems, CRM issues are involved to some degree in every incident or accident.

## III   Company Culture and Policies

It should be recognized that many factors associated with incidents and accidents are embedded in the organization of the whole aviation system.

The flightcrew is considered to be the last link in the error-chain but it is also the last line-of-defense.

Company safety culture and policies should therefore:

- Support the implementation of CRM practices;

- Facilitate the mitigation of organizational factors; and,

- Identify and address precursors of potential incidents or accidents.

## IV   International Cultural Factors

As more operators access to global international operation with multi-nationality crewmembers, cross-cultural issues should become an important part of a customized CRM training.

The discussion of cross-cultural factors should include:

- Highlighting the importance of cultural and national sensitivities; and,

- Promoting the use of standard phraseology as a common working language.

## V   Leadership

The PIC must demonstrate the focus and energy required to motivate the crew to work together as a team.

The role of the pilot-in-command (PIC) in complex and demanding situations should be emphasized during CRM training.

This includes, for example, approaches with marginal weather conditions or abnormal / emergency conditions that are beyond the scope of published procedures.

## VI   Teamwork

Effective teamwork requires effective command and leadership by the PIC and effective support by all crew members.

Teamwork enhances the crew problem-solving capability in dealing with normal, abnormal and emergency situations.

Achieving effective teamwork requires the optimum use of the following crew resources :

- Communication skills;

- Monitoring skills;

- Technical proficiency;

- Advocacy / inquiry; and,

- Dedication to success.

The captain's role and attitude in opening the line of communication with the first officer and cabin crew is of prime importance for setting the flight deck atmosphere and ensuring effective:

- Teamwork (e.g., creating a synergy among crew members, allowing the authority and duty for the first officer to voice any concern as to the progress of the flight and overall safety);

- Crew coordination, mutual monitoring and backup; and,

- Human relations (e.g., effective intra-crew communications).

Performing a pre-flight briefing that includes the flight crew and cabin crew establishes the basis for effective teamwork.

Flight attendants may hesitate to report technical occurrences to flight crew (i.e., because of cultural aspects, company policies or intimidation).

To overcome this reluctance, the implementation and interpretation of the sterile cockpit rule (as applicable) should be discussed during cabin crew CRM training and recalled by the captain during the pre-flight briefing.

When performing the operational and human factors analysis of operational events, Airbus qualifies teamwork aspects, using the following markers :

- Flight preparation and planning;

- Intra-cockpit communications;

- Cockpit crew / cabin crew communications ;

- Cultural / language factors;

- Priority setting;

- Quality of briefings;

- Flight monitoring;

- Workload management;

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- Mutual cross-check and back-up;
- Adherence to standard calls;
- Strategic (long term) decision making;
- Tactical (short term) decision making;
- Situational awareness;
- Interruptions and distractions management;
- Effective use of all crew resources.

## VII  Assertiveness

Incidents and accidents illustrate that if an option (e.g., performing a go-around) has not been prepared, flight crew may lack the mental resources needed to:

- Make the required decision (i.e., initiate the go-around); or,
- Correctly conduct the required maneuver (i.e., flying the published missed-approach).

Fatigue or reluctance to change a prepared plan often are the probable causes for a lack of assertiveness (assessment of situation) and decision-making.

## VIII  Inquiry and Advocacy

Flight crews often are faced with ATC requests that are either:

- Not understood (e.g., being assigned an altitude below the sector MSA, when the minimum vectoring altitude is not published); or,
- Challenging (e.g., being requested to fly higher and/or faster than desired or to take a shorter routing than desired).

Flight crews should not accept such instructions without requesting clarification or being sure that they can comply safely with the ATC instructions.

## IX  Time Management

Taking time to make time, developing multi-tasking ability and ensuring task prioritization are essential factors in staying ahead of the aircraft :

- Buy time by not accepting time pressure; and,
- Beware of tasks that are time consuming, such as FMS programming.

The Flight Crew Training Manual – Operational Philosophy - Golden Rules for Pilots describes the various steps of a typical tactical-decision-making model, for use in time-critical situations.

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## X   Managing Interruptions and Distractions

Coping with unexpected distraction, disturbance and contingency in the cockpit requires the use of techniques to lessen the effects of any disruption in the flow of on-going cockpit activities.

Flight crews should " expect the unexpected ".

## XI   Threat Management

A threat is a condition that affects or complicates the performance of a task or the compliance with applicable standards.

Adverse weather, terrain, airspace congestion, challenging ATC instructions, etc … are threat that may affect flight operations.

When performing the operational and human factors analysis of operational events, Airbus qualifies threat management aspects, using the following markers :

- Threat anticipated and briefed;

- Threat avoided / prevented;

- Threat not recognized;

- Threat consequential or inconsequential;

- Threat managed / recovered / mitigated; and/or,

- Threat late identification, assessment and management.

## XII   Error Management

Crew errors often are induced by interruptions and distractions resulting from :

- Intra-cockpit activities; or,

- External threats (e.g., ATC instructions, weather conditions, etc).

Error-management training and techniques should be considered at company level and at personal level.

The various Flight Operations Briefing Notes list and discuss the influence factors (i.e., error factors) that are relevant for each subject, in order to identify or suggest the development of associated:

- Company prevention strategies; and,

- Personal lines-of-defenses.

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The most critical aspect in discussing error management is not the initial error or deviation but the failure to detect this error or deviation, by mutual monitoring and backup.

When performing the operational and human factors analysis of operational events, Airbus qualifies error management aspects, using the following markers :

- Detected or undetected inadvertent action;

- Detected or undetected action slip;

- Detected or undetected entry error;

- Detected error challenged or not;

- Detected error corrected or not;

- Error outcome consequential or inconsequential;

- Error resulting or not in an aircraft undesired state; and,

- Successful or unsuccessful recovery technique / action.

## XIII   Risk Management

The concept of risk combines the notions of severity and probability, with reference to a given hazard.

A hazard is a condition that has the potential to cause personal injury or death, property damage or operational degradation.

Runway excursion, runway overrun, CFIT, loss of control in flight or on ground, etc … are typical hazards in terms of flight operations.

The severity of a given threat rarely can be significantly reduced but its probability of occurrence can be largely reduced by implementing related prevention strategies (e.g., safety awareness and training programs).

For the flight crew, risk management often consists in assessing the effects of potential hazards on the safe conduct of the flight and in finding ways to avoid these hazards or to minimize their effects.

Decision-making is to be considered as risk-management at flight crew level.

Risk management also should be seen as a balanced management of priorities.

Risk management sometimes is described as opposing:

- A sure inconvenience (e.g., associated with a go-around or a diversion); against,

- A probable-only risk (e.g., risk associated with an unstabilized approach to a long and dry runway).

A practical and safety-oriented method of risk management is entirely contained in the concept and techniques of tactical-decision-making (refer to the Flight Crew Training Manual – Operational Philosophy - Golden Rules for Pilots).

## XIV Decision Making

SOPs sometimes are perceived as limiting the flight crew's judgment and decision.

Without denying the captain's emergency authority, SOPs are safeguards against biased decision-making.

Effective flightcrew decision-making requires a joint evaluation of possible options prior to proceeding with an agreed-upon decision and action.

The effect of pressures (e.g., delays, company policies, ATC requests, etc) that may affect how the crew conducts the flight and makes decisions should be acknowledged by the industry.

Nevertheless, eliminating all pressures is not a realistic objective. Thus, company accident-prevention strategies, CRM techniques and personal lines-of-defense should be used to cope effectively with such pressures.

The use of a tactical-decision-making model for time-critical situations often is an effective technique to lessen the effects of pressures.

Several tactical-decision-making models (usually based on memory aids or on sequential models) have been developed and should be discussed during CRM training.

All tactical-decision-making models share the following phases (refer to the Flight Crew Training Manual – Operational Philosophy - Golden Rules for Pilots) :

- Recognizing the prevailing condition (i.e., identifying the problem);

- Assessing short term and long term consequences on the flight (i.e., collecting the facts and assessing their operational implications);

- Evaluating available options and procedures (i.e., identifying and evaluating alternatives);

- Deciding the course of actions (i.e., selecting the best mutually-agreed alternative);

- Taking actions in accordance with the defined procedures and applicable task-sharing (i.e., implementing the selected option);

- Evaluating and monitoring action results (i.e., confirming expectations versus observed facts); and,

- Resuming standard flying duties (i.e., resuming operation in accordance with SOP's, including the use of standard calls and normal checklists).

The above decision-making-model should optimize the available crew resources in terms of :

- Interpersonal communications;

- Inquiry and advocacy;

- Effective listening;

- Tasks prioritization ability;

- Self confidence, but also self-critical-analysis.

Postponing a decision until that option is no more considered or no longer available is a recurring pattern in incidents and accidents, particularly in approach-and-landing accidents.

The concepts of next-target and approach-gate are intended to act as milestones for supporting a timely decision-making process.

## XV   Other CRM Aspects

The following other CRM aspects have been observed in most incidents or accidents:

- Spatial disorientation (i.e., physiological illusions and/or visual illusions);

- Complacency when operating at a familiar airport (e.g., home base); or,

- Overconfidence;

- Inadequate anticipation (i.e., inability to stay ahead of the aircraft);

- Inadequate preparation to respond to changing situations or to an abnormal / emergency condition, by precise planning and use of all available technical and human resources (i.e., by expecting the unexpected);

- Crewmembers personal factors; and/or,

- Absence of specific training of instructors and check airmen to evaluate the CRM performance of trainees and line pilots.

## XVI   Factors Affecting CRM Practice

The following organizational or personal factors may adversely affect the effective implementation of CRM practices:

- Company culture and policies;

- Belief that actions or decisions are correct, although they deviates from the applicable standards;

- Effect of fatigue and absence of countermeasures to restore the level of vigilance and alertness; and/or,

- Reluctance to accept the influence of human factors and CRM issues in incidents or accidents.

## XVII    Summary of Key Points

CRM practices optimize the performance of the entire crew (i.e., including cabin crew and maintenance personnel).

CRM skills effectively:

- Relieve the effects of pressures, interruptions and distractions;

- Provide milestones for timely decision-making; and,

- Provide safeguards for effective error-management, thus minimizing the effects of working errors.

First and foremost, CRM is a matter of mindset and attitude; the analysis of incidents and accidents suggest highlighting a key attitude in terms of safety enhancement :

*" Nothing should ever be taken for granted "*

## XVIII    Associated Briefing Notes

The following Flight Operations Briefing Notes provide expanded information to complement the above overview :

- **Operating Philosophy - SOPs**

- **Optimum Use of Automation**

- **Standard Calls**

- **Normal Checklists**

- **Conducting Effective Briefings**

- **Human Factors in Incidents / Accidents**

- **Effective Pilot / Controller Communications**

- **Managing Interruptions and Distractions**

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## XIX   Regulatory References

- ICAO – Annex 6 – Operation of Aircraft, Part I – International Commercial Air Transport – Aeroplanes, Appendix 2, 5.15, 5.21 and 5.22.

- ICAO – Procedures for Air Navigation Services – Rules of the Air and Air Traffic Services (PANS-RAC, Doc 9432).

- ICAO – Procedures for Air navigation Services – Aircraft operations (PANS-OPS, Doc 8168), Volume I – Flight Procedures (Post Amendment No 11, applicable Nov.1/2001).

- ICAO – Accident Prevention Manual (Doc 9422).

- ICAO – Human Factors Training Manual (Doc 9683).

- ICAO – Human Factors Digest No 8 – Human Factors in Air Traffic Control (Circular 241).

- FAR 121.406, 121.419, 121.421 or 121.422 - CRM Training for pilots, cabin crew and aircraft dispatchers.

- FAA – AC 60-22 – Aeronautical Decision Making.

- JAR-OPS 1.945, 1.955 or 1.965 - CRM Training.

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